Soda Bottle KALEIDOSCOPE

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Here are plans to make a kaleidoscope from materials in any schoolroom. Students will learn about how to make mirrors reflect light with an artistic touch.

Parts needed:

2 Plastic 20 ounce Beverage bottles, one cylindrical, one contoured
2 microscope slides
1 toilet paper tube
flat black paint
shirt cardboard
clear plastic viewgraph sheet
confetti, glitter, buttons, shredded wrapping paper, foil, or any small colorful reflective or transparent objects

Tools needed:

Knife or hack saw to cut bottle
Knife or scissors to cut cardboard

Assembly Instructions:

Lay out the two microscope slides flat and paint the top side of them black. Set aside to dry. *Note: Always be careful handling glass.*

Start with the cylindrical beverage bottle. Cut the screw top off the beverage bottle neck with the saw or knife. Discard the top. Carefully and evenly, cut the bottom off the bottle on its maximum diameter at the lower edge of the label wrapping. Take the contoured body bottle and cut the bottom off also at the lower edge of the label wrapping. This contoured bottle bottom should just fit inside the other bottle. See Figure 1.

Figure 1.

Trace the centering pieces from the pattern on to the cardboard and cut them out with scissors or knife. Cut out the hole in the large ring and the "**V**" slot in the small discs. Clean any ragged cuts off the edges. Also, cut out the retainer disc from the clear plastic.

When the paint on the slides is completely dry, insert the slides into the slots in the centering discs. The discs will be ¼" from the edge of the slides. The slides must have the painted surface on the *outside* of the '**V**' that is formed when the mirror is assembled. The glass at the apex will fit together tightly along its entire length when properly assembled. See Figure 2.

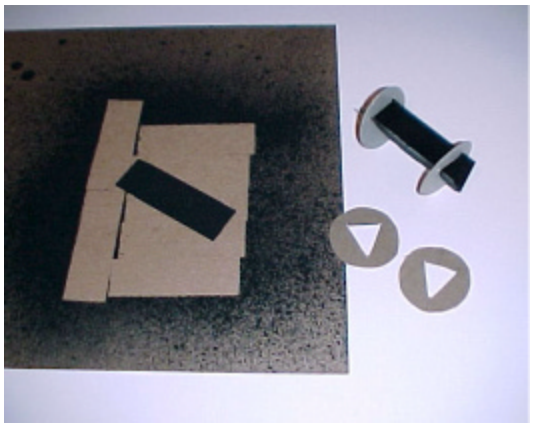


Figure 2.

Insert the mirror assembly (slides with discs) into the paper tube. The mirror edge should be even with the front end of the tube. Push the other end of tube into the large centering ring until it is ½" from the back end. Insert the front end of the tube into the bottle far enough for the tube to fit up against the tapered neck. All pieces should be friction tight in their proper position. If not, secure them in place with white glue. See Figure 3.

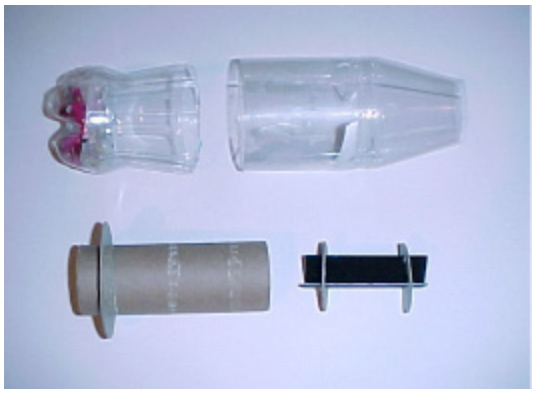


Figure 3.

The kaleidoscope will now show reflected patterns of nearby objects. Look through the '**V**' formed by the mirrors in the bottle neck to see them.

Sprinkle confetti or glitter into the bottle bottom piece. Partially fill up the contoured cells. Then cover them with the clear plastic disc pushing it down into the bottle piece until it stays in place and contains the glitter. See Figure 4.

Figure 4.

The glitter should be able to move around loose in the bottom but not fall out. Slide the bottom piece into the bottle until it stays in place and is able to rotate within the bottle. See Figure 5.

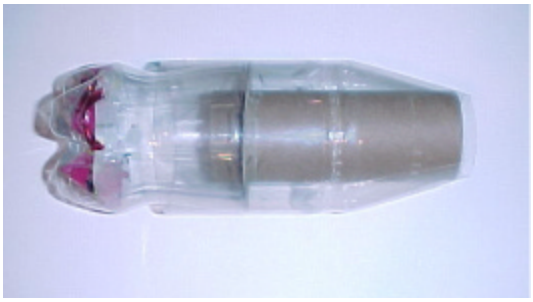
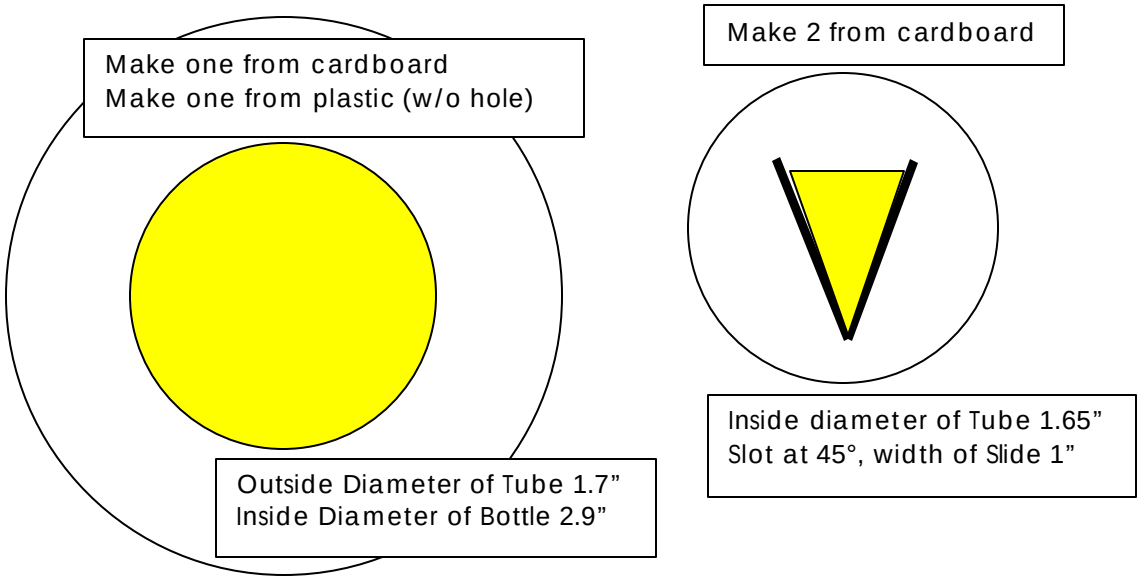


Figure 5.

Now look through the neck into the mirrors. The glitter will be reflected to form the classic colorful kaleidoscope pattern. Turn the bottom piece slightly to move the glitter and see the pattern move with it. Try looking at a light source to change and brighten the image. For another effect, leave the glitter out of the bottom piece and observe the image formed by the cells themselves, which act as lenses. Or, use the bottom of a colored bottle for a different effect.

PATTERN SHEET



How does it work?

In 1817 the optical physicist David Brewster was granted a patent for a tube with mirrors, not to be used as a scientific device, but as a parlor novelty, or as he called it, “an ocular harpsichord.”
The kaleidoscope creates reflections of reflections of a direct view of the objects at the end. The image will be symmetrical if the mirror angle is an even divider of 360 degrees. A mirror set at 60 degrees will generate a pattern of six regular sectors. A mirror angle at 45 degrees will make eight equal sectors, and an angle of 30 degrees will make twelve. The lines and colors of simple shapes are multiplied by the mirrors into a visually stimulating vortex.

Kaleidoscope Side View Cross Section